

SEQUENCE LISTING

<110> NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY
AMERSHAM BIOSCIENCES KK

<120> Novel acetylgalactosamine transferases and nucleic acids encoding
the same

<130> YCT-860

<150> JP2002-236292

<151> 2002-08-14

<160> 34

<210> 1

<211> 1039

<212> PRT

<213> Homo sapiens

<400> 1

Met Pro Arg Leu Pro Val Lys Lys Ile Arg Lys Gln Met Lys Leu Leu

1

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10

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Leu Leu Leu Leu Leu Leu Ser Cys Ala Ala Trp Leu Thr Tyr Val His

20

25

30

Leu Gly Leu Val Arg Gln Gly Arg Ala Leu Arg Gln Arg Leu Gly Tyr

35

40

45

Gly Arg Asp Gly Glu Lys Leu Thr Ser Glu Thr Asp Gly Arg Gly Val
50 55 60

His Ala Ala Pro Ser Thr Gln Arg Ala Glu Asp Ser Ser Glu Ser Arg
65 70 75 80

Glu Glu Glu Gln Ala Pro Glu Gly Arg Asp Leu Asp Met Leu Phe Pro
85 90 95

Gly Gly Ala Gly Arg Leu Pro Leu Asn Phe Thr His Gln Thr Pro Pro
100 105 110

Trp Arg Glu Glu Tyr Lys Gly Gln Val Asn Leu His Val Phe Glu Asp
115 120 125

Trp Cys Gly Gly Ala Val Gly His Leu Arg Arg Asn Leu His Phe Pro
130 135 140

Leu Phe Pro His Thr Arg Thr Thr Val Lys Lys Leu Ala Val Ser Pro
145 150 155 160

Lys Trp Lys Asn Tyr Gly Leu Arg Ile Phe Gly Phe Ile His Pro Ala
165 170 175

Arg Asp Gly Asp Val Gln Phe Ser Val Ala Ser Asp Asp Asn Ser Glu
180 185 190

Phe Trp Leu Ser Leu Asp Glu Ser Pro Ala Ala Ala Gln Leu Val Ala
195 200 205

Phe Val Gly Lys Thr Gly Ser Glu Trp Thr Ala Pro Gly Glu Phe Thr
210 215 220

Lys Phe Ser Ser Gln Val Ser Lys Pro Arg Arg Leu Met Ala Ser Arg
225 230 235 240

Arg Tyr Tyr Phe Glu Leu Leu His Lys Gln Asp Asp Arg Gly Ser Asp
245 250 255

His Val Glu Val Gly Trp Arg Ala Phe Leu Pro Gly Leu Lys Phe Glu
260 265 270

Val Ile Ser Ser Ala His Ile Ser Leu Tyr Thr Asp Glu Ser Ala Leu
275 280 285

Lys Met Asp His Val Ala His Val Pro Gln Ser Pro Ala Ser His Val
290 295 300

Gly Gly Arg Pro Pro Gln Glu Glu Thr Ser Ala Asp Met Leu Arg Pro
305 310 315 320

Asp Pro Arg Asp Thr Phe Phe Leu Thr Pro Arg Met Glu Ser Ser Ser
325 330 335

Leu Glu Asn Val Leu Glu Pro Cys Ala Tyr Ala Pro Thr Tyr Val Val
340 345 350

Lys Asp Phe Pro Ile Ala Arg Tyr Gln Gly Leu Gln Phe Val Tyr Leu

355

360

365

Ser Phe Val Tyr Pro Asn Asp Tyr Thr Arg Leu Thr His Met Glu Thr

370

375

380

Asp Asn Lys Cys Phe Tyr Arg Glu Ser Pro Leu Tyr Leu Glu Arg Phe

385

390

395

400

Gly Phe Tyr Lys Tyr Met Lys Met Asp Lys Glu Glu Gly Asp Glu Asp

405

410

415

Glu Glu Asp Glu Val Gln Arg Arg Ala Phe Leu Phe Leu Asn Pro Asp

420

425

430

Asp Phe Leu Asp Asp Glu Asp Glu Gly Glu Leu Leu Asp Ser Leu Glu

435

440

445

Pro Thr Glu Ala Ala Pro Pro Arg Ser Gly Pro Gln Ser Pro Ala Pro

450

455

460

Ala Ala Pro Ala Gln Pro Gly Ala Thr Leu Ala Pro Pro Thr Pro Pro

465

470

475

480

Arg Pro Arg Asp Gly Gly Thr Pro Arg His Ser Arg Ala Leu Ser Trp

485

490

495

Ala Ala Arg Ala Ala Arg Pro Leu Pro Leu Phe Leu Gly Arg Ala Pro

500

505

510

Pro Pro Arg Pro Ala Val Glu Gln Pro Pro Pro Lys Val Tyr Val Thr
515 520 525

Arg Val Arg Pro Gly Gln Arg Ala Ser Pro Arg Ala Pro Ala Pro Arg
530 535 540

Ala Pro Trp Pro Pro Phe Pro Gly Val Phe Leu His Pro Arg Pro Leu
545 550 555 560

) Pro Arg Val Gln Leu Arg Ala Pro Pro Arg Pro Pro Arg Pro His Gly
565 570 575

Arg Arg Thr Gly Gly Pro Gln Ala Thr Gln Pro Arg Pro Pro Ala Arg
580 585 590

Ala Gln Ala Thr Gln Gly Gly Arg Glu Gly Gln Ala Arg Thr Leu Gly
595 600 605

) Pro Ala Ala Pro Thr Val Asp Ser Asn Leu Ser Ser Glu Ala Arg Pro
610 615 620

Val Thr Ser Phe Leu Ser Leu Ser Gln Val Ser Gly Pro Gln Leu Pro
625 630 635 640

Gly Glu Gly Glu Glu Glu Glu Glu Gly Glu Asp Asp Gly Ala Pro Gly
645 650 655

Asp Glu Ala Ala Ser Glu Asp Ser Glu Glu Ala Ala Gly Pro Ala Leu
660 665 670

Gly Arg Trp Arg Glu Asp Ala Ile Asp Trp Gln Arg Thr Phe Ser Val
675 680 685

Gly Ala Val Asp Phe Glu Leu Leu Arg Ser Asp Trp Asn Asp Leu Arg
690 695 700

Cys Asn Val Ser Gly Asn Leu Gln Leu Pro Glu Ala Glu Ala Val Asp
705 710 715 720

Val Thr Ala Gln Tyr Met Glu Arg Leu Asn Ala Arg His Gly Gly Arg
725 730 735

Phe Ala Leu Leu Arg Ile Val Asn Val Glu Lys Arg Arg Asp Ser Ala
740 745 750

Arg Gly Ser Arg Phe Leu Leu Glu Leu Glu Leu Gln Glu Arg Gly Gly
755 760 765

Gly Arg Leu Arg Leu Ser Glu Tyr Val Phe Leu Arg Leu Pro Gly Ala
770 775 780

Arg Val Gly Asp Ala Asp Gly Glu Ser Pro Glu Pro Ala Pro Ala Ala
785 790 795 800

Ser Val Arg Pro Asp Gly Arg Pro Glu Leu Cys Arg Pro Leu Arg Leu
805 810 815

Ala Trp Arg Gln Asp Val Met Val His Phe Ile Val Pro Val Lys Asn

	820	825	830
Gln Ala Arg Trp Val Ala Gln Phe Leu Ala Asp Met Ala Ala Leu His			
	835	840	845
Ala Arg Thr Gly Asp Ser Arg Phe Ser Val Val Leu Val Asp Phe Glu			
	850	855	860
Ser Glu Asp Met Asp Val Glu Arg Ala Leu Arg Ala Ala Arg Leu Pro			
	865	870	875
			880
Arg Tyr Gln Tyr Leu Arg Arg Thr Gly Asn Phe Glu Arg Ser Ala Gly			
	885	890	895
Leu Gln Ala Gly Val Asp Ala Val Glu Asp Ala Ser Ser Ile Val Phe			
	900	905	910
Leu Cys Asp Leu His Ile His Phe Pro Pro Asn Ile Leu Asp Gly Ile			
	915	920	925
Arg Lys His Cys Val Glu Gly Arg Leu Ala Phe Ala Pro Val Val Met			
	930	935	940
Arg Leu Ser Cys Gly Ser Ser Pro Arg Asp Pro His Gly Tyr Trp Glu			
	945	950	955
			960
Val Asn Gly Phe Gly Leu Phe Gly Ile Tyr Lys Ser Asp Phe Asp Arg			
	965	970	975

Val Gly Gly Met Asn Thr Glu Glu Phe Arg Asp Gln Trp Gly Gly Glu
 980 985 990

Asp Trp Glu Leu Leu Asp Arg Val Leu Gln Ala Gly Leu Glu Val Glu
 995 1000 1005

Arg Leu Arg Leu Arg Asn Phe Tyr His His Tyr His Ser Lys Arg Gly
 1010 1015 1020

Met Trp Ser Val Arg Ser Arg Lys Gly Ser Arg Thr Gly Ala Ser
 1025 1030 1035 1039

<210> 2

<211> 3120

<212> DNA

<213> Homo sapiens

<400> 2

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 Met Pro Arg Leu Pro Val Lys Lys Ile Arg Lys Gln Met Lys Leu Leu
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ctg ctg ctg ctg ctg ctg agc tgc gcc gcg tgg ctc acc tac gtg cac 96
 Leu Leu Leu Leu Leu Leu Ser Cys Ala Ala Trp Leu Thr Tyr Val His
 20 25 30

ctg ggc ctg gtg cgc cag gga cgc gcg ctg cgc cag cgc ctg ggc tac 144
 Leu Gly Leu Val Arg Gln Gly Arg Ala Leu Arg Gln Arg Leu Gly Tyr

35	40	45	
ggg cga gat ggt gag aag ctg acc agt gag acc gac ggc cgg ggg gtc			192
Gly Arg Asp Gly Glu Lys Leu Thr Ser Glu Thr Asp Gly Arg Gly Val			
50	55	60	
cac gct gcg cca tcc aca cag agg gct gag gac tcc agt gag agc cgt			240
His Ala Ala Pro Ser Thr Gln Arg Ala Glu Asp Ser Ser Glu Ser Arg			
65	70	75	80
gaa gag gag caa gcg ccc gaa ggt cgg gac cta gac atg ctg ttt cct			288
Glu Glu Glu Gln Ala Pro Glu Gly Arg Asp Leu Asp Met Leu Phe Pro			
85	90	95	
ggg ggg gct ggg agg ctg cca ctg aac ttc acc cat cag aca ccc cca			336
Gly Gly Ala Gly Arg Leu Pro Leu Asn Phe Thr His Gln Thr Pro Pro			
100	105	110	
tgg cgg gag gag tac aag ggg cag gtg aac ctg cac gtg ttt gag gac			384
Trp Arg Glu Glu Tyr Lys Gly Gln Val Asn Leu His Val Phe Glu Asp			
115	120	125	
tgg tgt ggg ggc gcc gtg ggc cac ctg agg agg aac ctg cac ttc ccg			432
Trp Cys Gly Gly Ala Val Gly His Leu Arg Arg Asn Leu His Phe Pro			
130	135	140	
ctg ttc cct cat acg cgc acc acc gtg aag aag ttg gcc gtg tcc ccc			480
Leu Phe Pro His Thr Arg Thr Thr Val Lys Lys Leu Ala Val Ser Pro			
145	150	155	160

aag tgg aag aac tat gga ctc cgt att ttt ggt ttc atc cac ccg gcg	528
Lys Trp Lys Asn Tyr Gly Leu Arg Ile Phe Gly Phe Ile His Pro Ala	
165 170 175	
agg gac gga gac gtc cag ttt tct gtg gcc tca gac gac aac tcg gag	567
Arg Asp Gly Asp Val Gln Phe Ser Val Ala Ser Asp Asp Asn Ser Glu	
180 185 190	
ttc tgg ctg agt ctg gac gag agc cct gct gct gcc cag ctt gtg gcc	624
Phe Trp Leu Ser Leu Asp Glu Ser Pro Ala Ala Ala Gln Leu Val Ala	
195 200 205	
ttt gtg ggc aag act ggc tcc gag tgg aca gcg cct gga gaa ttc acc	672
Phe Val Gly Lys Thr Gly Ser Glu Trp Thr Ala Pro Gly Glu Phe Thr	
210 215 220	
aag ttc agc tcc cag gtg tcc aag ccc agg cgg ctc atg gcc tcc cgg	720
Lys Phe Ser Ser Gln Val Ser Lys Pro Arg Arg Leu Met Ala Ser Arg	
225 230 235 240	
agg tac tac ttt gag ttg ctg cac aag cag gac gac cgc ggc tcg gac	768
Arg Tyr Tyr Phe Glu Leu Leu His Lys Gln Asp Asp Arg Gly Ser Asp	
245 250 255	
cac gtg gaa gtg ggc tgg cga gct ttc ctg ccc ggc ctg aag ttc gag	816
His Val Glu Val Gly Trp Arg Ala Phe Leu Pro Gly Leu Lys Phe Glu	
260 265 270	

gtc atc agc tct gct cac atc tcc ctg tac aca gat gag tca gcc ttg 864
Val Ile Ser Ser Ala His Ile Ser Leu Tyr Thr Asp Glu Ser Ala Leu

275 280 285

aag atg gac cac gtg gcg cac gtc ccc cag tct cca gcc agc cac gtg 912
Lys Met Asp His Val Ala His Val Pro Gln Ser Pro Ala Ser His Val

290 295 300

ggg ggg cgt ccg ccg cag gag gag acc agc gca gac atg ctg cgg cca 960
Gly Gly Arg Pro Pro Gln Glu Glu Thr Ser Ala Asp Met Leu Arg Pro

305 310 315 320

gat ccc agg gat acc ttt ttc ctc act cca cgc atg gaa tct tcg agc 1008
Asp Pro Arg Asp Thr Phe Phe Leu Thr Pro Arg Met Glu Ser Ser Ser

325 330 335

ctg gag aac gtg ctg gag ccc tgc gcc tac gcc ccc acc tac gtg gtc 1056
Leu Glu Asn Val Leu Glu Pro Cys Ala Tyr Ala Pro Thr Tyr Val Val

340 345 350

aag gac ttc ccg atc gcc aga tac cag ggc ctg caa ttt gtg tac ctg 1104
Lys Asp Phe Pro Ile Ala Arg Tyr Gln Gly Leu Gln Phe Val Tyr Leu

355 360 365

tcc ttc gtt tat ccc aac gac tac act cgc ctc acc cac atg gag acg 1152
Ser Phe Val Tyr Pro Asn Asp Tyr Thr Arg Leu Thr His Met Glu Thr

370 375 380

gac aac aag tgc ttc tac cgc gag tct ccg ctg tat ctg gag agg ttt 1200

Asp Asn Lys Cys Phe Tyr Arg Glu Ser Pro Leu Tyr Leu Glu Arg Phe
 385 390 395 400

ggg ttc tat aaa tac atg aag atg gac aag gag gag ggg gat gag gat 1248
 Gly Phe Tyr Lys Tyr Met Lys Met Asp Lys Glu Glu Gly Asp Glu Asp
 405 410 415

gaa gaa gac gag gtg cag cgc cga gcc ttc ctc ttc ctc aac ccg gac 1296
 Glu Glu Asp Glu Val Gln Arg Arg Ala Phe Leu Phe Leu Asn Pro Asp
 420 425 430

gac ttc ctg gac gac gag gac gag ggg gag ctg ctc gac agc ctg gag 1344
 Asp Phe Leu Asp Asp Glu Asp Glu Gly Glu Leu Leu Asp Ser Leu Glu
 435 440 445

ccc acc gag gcg gcc ccg ccc agg agc ggc ccc cag tcc ccc gcc cca 1392
 Pro Thr Glu Ala Ala Pro Pro Arg Ser Gly Pro Gln Ser Pro Ala Pro
 450 455 460

gca gcc ccc gcc cag ccc gga gcc acc ctc gcc ccg ccg acc cct ccc 1440
 Ala Ala Pro Ala Gln Pro Gly Ala Thr Leu Ala Pro Pro Thr Pro Pro
 465 470 475 480

cgc ccc cgg gac ggg ggg acc ccc agg cac tcc cgg gcc ctg agc tgg 1488
 Arg Pro Arg Asp Gly Gly Thr Pro Arg His Ser Arg Ala Leu Ser Trp
 485 490 495

gcc gcc agg gcc gcc cgc cct ttg ccg ctc ttc ttg ggc cga gct ccg 1536
 Ala Ala Arg Ala Ala Arg Pro Leu Pro Leu Phe Leu Gly Arg Ala Pro

500	505	510	
ccc ccg cgc cct gca gtg gag cag ccg ccc cca aag gig tac gtg acc	1584		
Pro Pro Arg Pro Ala Val Glu Gln Pro Pro Pro Lys Val Tyr Val Thr			
515	520	525	
agg gtg cgg ccg gga cag cgg gca tcc ccc cgg gcc cca gcg ccg cgt	1632		
Arg Val Arg Pro Gly Gln Arg Ala Ser Pro Arg Ala Pro Ala Pro Arg			
530	535	540	
gcg ccc tgg ccg ccc ttc cct ggc gtc ttc ctg cac ccc agg cct ctg	1680		
Ala Pro Trp Pro Pro Phe Pro Gly Val Phe Leu His Pro Arg Pro Leu			
545	550	555	560
ccc aga gig cag ctg cgg gcg ccc cca cgc cca ccc cgg ccc cac ggc	1728		
Pro Arg Val Gln Leu Arg Ala Pro Pro Arg Pro Pro Arg Pro His Gly			
565	570	575	
cgc agg acc ggc ggc ccc cag gcc aca cag ccg agg ccc cca gcc cgg	1776		
Arg Arg Thr Gly Gly Pro Gln Ala Thr Gln Pro Arg Pro Pro Ala Arg			
580	585	590	
gcg cag gcc acc caa ggg ggc cgg gag ggc cag gcg cgc acg ctg gga	1824		
Ala Gln Ala Thr Gln Gly Gly Arg Glu Gly Gln Ala Arg Thr Leu Gly			
595	600	605	
cct gcg gcg ccc aca gtg gac tca aac ttg tcc tcc gaa gcg cgg ccc	1872		
Pro Ala Ala Pro Thr Val Asp Ser Asn Leu Ser Ser Glu Ala Arg Pro			
610	615	620	

gtg acc tcc ttc ctg agc ttg tcc cag gtg tcc ggg ccg cag ctg ccc 1920
Val Thr Ser Phe Leu Ser Leu Ser Gln Val Ser Gly Pro Gln Leu Pro
625 630 635 640

ggg gag ggc gaa gag gag gag gaa ggg gag gac gat ggg gcc ccg ggc 1968
Gly Glu Gly Glu Glu Glu Glu Glu Gly Glu Asp Asp Gly Ala Pro Gly
645 650 655

gac gag gcc gcg tcg gag gac agc gag gag gcc gcg ggc ccg gcg ctc 2016
Asp Glu Ala Ala Ser Glu Asp Ser Glu Glu Ala Ala Gly Pro Ala Leu
660 665 670

gga cgc tgg cgt gag gac gcc atc gac tgg cag cgc acg ttc agc gtg 2064
Gly Arg Trp Arg Glu Asp Ala Ile Asp Trp Gln Arg Thr Phe Ser Val
675 680 685

ggc gcc gtg gac ttc gag ctg ctg cgc tcg gac tgg aac gac ctg cga 2112
Gly Ala Val Asp Phe Glu Leu Leu Arg Ser Asp Trp Asn Asp Leu Arg
690 695 700

tgc aac gtt tcg ggg aac ctg cag ctg ccg gag gcg gag gcc gtg gac 2160
Cys Asn Val Ser Gly Asn Leu Gln Leu Pro Glu Ala Glu Ala Val Asp
705 710 715 720

gtg acc gct cag tac atg gag cgg ctg aac gcg cgc cac ggc ggg cgc 2208
Val Thr Ala Gln Tyr Met Glu Arg Leu Asn Ala Arg His Gly Gly Arg
725 730 735

ttc gcg ctt ctg cgc atc gtg aac gtg gag aag cgc cgg gac tcg gcg 2256
Phe Ala Leu Leu Arg Ile Val Asn Val Glu Lys Arg Arg Asp Ser Ala

740

745

750

cga ggg agt cgc ttc ctg ctg gag ctg gag ctg cag gag cgc ggg ggc 2304
Arg Gly Ser Arg Phe Leu Leu Glu Leu Glu Leu Gln Glu Arg Gly Gly

755

760

765

ggc cgc ctg cga ctg tcc gag tac gtc ttc ctg cgg ctg ccg gga gcc 2352
Gly Arg Leu Arg Leu Ser Glu Tyr Val Phe Leu Arg Leu Pro Gly Ala

770

775

780

cgc gta ggg gat gca gac gga gaa agt ccc gaa ccc gct ccc gcc gcc 2400
Arg Val Gly Asp Ala Asp Gly Glu Ser Pro Glu Pro Ala Pro Ala Ala

785

790

795

800

tcc gtg cgc ccc gac ggc cgc ccc gag ctc tgc cgg cca ctg cgc ctg 2448
Ser Val Arg Pro Asp Gly Arg Pro Glu Leu Cys Arg Pro Leu Arg Leu

805

810

815

gcc tgg cgc cag gac gtg atg gtt cac ttc atc gtg cca gtg aaa aac 2496
Ala Trp Arg Gln Asp Val Met Val His Phe Ile Val Pro Val Lys Asn

820

825

830

cag gca cgg tgg gtg gca cag ttc ctg gcg gac atg gct gcg ctg cac 2544
Gln Ala Arg Trp Val Ala Gln Phe Leu Ala Asp Met Ala Ala Leu His

835

840

845

gcg cgc acc ggg gac tcg cgt ttc agc gtc gtc ctg gtg gat ttc gag 2592

Ala Arg Thr Gly Asp Ser Arg Phe Ser Val Val Leu Val Asp Phe Glu

850

855

860

agc gag gat atg gac gtg gag cgg gcc ctg cgc gcc gcg cgc ctg ccc 2640

Ser Glu Asp Met Asp Val Glu Arg Ala Leu Arg Ala Ala Arg Leu Pro

865

870

875

880

cgg tac cag tac ctg aga cga acc ggg aac ttc gag cgc tcc gcc ggg 2688

Arg Tyr Gln Tyr Leu Arg Arg Thr Gly Asn Phe Glu Arg Ser Ala Gly

885

890

895

ctg cag gcg gga gtg gac gcg gta gag gac gcc agc agc atc gtg ttc 2736

Leu Gln Ala Gly Val Asp Ala Val Glu Asp Ala Ser Ser Ile Val Phe

900

905

910

ctc tgc gac ctg cac atc cac ttc cca ccc aac atc ctg gac ggc atc 2784

Leu Cys Asp Leu His Ile His Phe Pro Pro Asn Ile Leu Asp Gly Ile

915

920

925

cgc aag cac tgc gtg gag ggc agg ctg gcc ttc gcg ccc gtg gtc atg 2832

Arg Lys His Cys Val Glu Gly Arg Leu Ala Phe Ala Pro Val Val Met

930

935

940

cgc ctg agc tgc ggg agc tcg ccc cgg gac ccc cac ggt tac tgg gag 2880

Arg Leu Ser Cys Gly Ser Ser Pro Arg Asp Pro His Gly Tyr Trp Glu

945

950

955

960

gtg aac ggc ttt ggc ctt ttt ggg atc tac aag tcg gac ttt gac cgg 2928

Val Asn Gly Phe Gly Leu Phe Gly Ile Tyr Lys Ser Asp Phe Asp Arg

965	970	975	
ggt gga gga atg aac acg gag gag ttc cga gac cag tgg ggg ggt gaa	2976		
Val Gly Gly Met Asn Thr Glu Glu Phe Arg Asp Gln Trp Gly Gly Glu			
980	985	990	
gac tgg gag ctc ctg gac agg gtc ctg cag gca ggg ctg gag gtg gag	3024		
Asp Trp Glu Leu Leu Asp Arg Val Leu Gln Ala Gly Leu Glu Val Glu			
995	1000	1005	
cgg ctc cga ctg cgg aat ttc tat cac cac tac cac tcc aag agg ggc	3072		
Arg Leu Arg Leu Arg Asn Phe Tyr His His Tyr His Ser Lys Arg Gly			
1010	1015	1020	
atg tgg agc gtc cgc agc agg aag ggc tct cgc acg ggg gcg tct tga	3120		
Met Trp Ser Val Arg Ser Arg Lys Gly Ser Arg Thr Gly Ala Ser			
1025	1030	1035	1039

<210> 3

<211> 998

<212> PRT

<213> Homo sapiens

<400> 3

Met Gly Ser Pro Arg Ala Ala Arg Pro Pro Leu Leu Leu Arg Pro Val

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Lys Leu Leu Arg Arg Arg Phe Arg Leu Leu Leu Ala Leu Ala Val Val

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Ser Val Gly Leu Trp Thr Leu Tyr Leu Glu Leu Val Ala Ser Ala Gln					
	35		40		45
Val Gly Gly Asn Pro Leu Asn Arg Arg Tyr Gly Ser Trp Arg Glu Leu					
	50		55		60
Ala Lys Ala Leu Ala Ser Arg Asn Ile Pro Ala Val Asp Pro His Leu					
	65		70		75
Gln Phe Tyr His Pro Gln Arg Leu Ser Leu Glu Asp His Asp Ile Asp					
		85		90	95
Gln Gly Val Ser Ser Asn Ser Ser Tyr Leu Lys Trp Asn Lys Pro Val					
	100		105		110
Pro Trp Leu Ser Glu Phe Arg Gly Arg Ala Asn Leu His Val Phe Glu					
	115		120		125
Asp Trp Cys Gly Ser Ser Ile Gln Gln Leu Arg Arg Asn Leu His Phe					
	130		135		140
Pro Leu Tyr Pro His Ile Arg Thr Thr Leu Arg Lys Leu Ala Val Ser					
	145		150		155
Pro Lys Trp Thr Asn Tyr Gly Leu Arg Ile Phe Gly Tyr Leu His Pro					
	165		170		175

Phe Thr Asp Gly Lys Ile Gln Phe Ala Ile Ala Ala Asp Asp Asn Ala
180 185 190

Glu Phe Trp Leu Ser Leu Asp Asp Gln Val Ser Gly Leu Gln Leu Leu
195 200 205

Ala Ser Val Gly Lys Thr Gly Lys Glu Trp Thr Ala Pro Gly Glu Phe
210 215 220

Gly Lys Phe Arg Ser Gln Ile Ser Lys Pro Val Ser Leu Ser Ala Ser
225 230 235 240

His Arg Tyr Tyr Phe Glu Val Leu His Lys Gln Asn Glu Glu Gly Thr
245 250 255

Asp His Val Glu Val Ala Trp Arg Arg Asn Asp Pro Gly Ala Lys Phe
260 265 270

Thr Ile Ile Asp Ser Leu Ser Leu Ser Leu Phe Thr Asn Glu Thr Phe
275 280 285

Leu Gln Met Asp Glu Val Gly His Ile Pro Gln Thr Ala Ala Ser His
290 295 300

Val Asp Ser Ser Asn Ala Leu Pro Arg Asp Glu Gln Pro Pro Ala Asp
305 310 315 320

Met Leu Arg Pro Asp Pro Arg Asp Thr Leu Tyr Arg Val Pro Leu Ile
325 330 335

Pro Lys Ser His Leu Arg His Val Leu Pro Asp Cys Pro Tyr Lys Pro

340

345

350

Ser Tyr Leu Val Asp Gly Leu Pro Leu Gln Arg Tyr Gln Gly Leu Arg

355

360

365

Phe Val His Leu Ser Phe Val Tyr Pro Asn Asp Tyr Thr Arg Leu Ser

370

375

380

His Met Glu Thr His Asn Lys Cys Phe Tyr Gln Glu Asn Ala Tyr Tyr

385

390

395

400

Gln Asp Arg Phe Ser Phe Gln Glu Tyr Ile Arg Ile Asp Gln Pro Glu

405

410

415

Lys Gln Gly Leu Glu Gln Pro Gly Phe Glu Glu Asn Leu Leu Glu Glu

420

425

430

Ser Gln Tyr Gly Glu Val Ala Glu Glu Thr Pro Ala Ser Asn Asn Gln

435

440

445

Asn Ala Arg Met Leu Glu Gly Arg Gln Thr Pro Ala Ser Thr Leu Glu

450

455

460

Gln Asp Ala Thr Asp Tyr Arg Leu Arg Ser Leu Arg Lys Leu Leu Ala

465

470

475

480

Gln Pro Arg Glu Gly Leu Leu Ala Pro Phe Ser Lys Arg Asn Ser Thr

	485	490	495
Ala Ser Phe Pro Gly Arg Thr Ser His Ile Pro Val Gln Gln Pro Glu			
	500	505	510
Lys Arg Lys Gln Lys Pro Ser Pro Glu Pro Ser Gln Asp Ser Pro His			
	515	520	525
Ser Asp Lys Trp Pro Pro Gly His Pro Val Lys Asn Leu Pro Gln Met			
	530	535	540
Arg Gly Pro Arg Pro Arg Pro Ala Gly Asp Ser Pro Arg Lys Thr Gln			
545	550	555	560
Trp Leu Asn Gln Val Glu Ser Tyr Ile Ala Glu Gln Arg Arg Gly Asp			
	565	570	575
Arg Met Arg Pro Gln Ala Pro Gly Arg Gly Trp His Gly Glu Glu Glu			
	580	585	590
Val Val Ala Ala Ala Gly Gln Glu Gly Gln Val Glu Gly Glu Glu Glu			
	595	600	605
Gly Glu Glu Glu Glu Glu Glu Glu Asp Met Ser Glu Val Phe Glu Tyr			
	610	615	620
Val Pro Val Phe Asp Pro Val Val Asn Trp Asp Gln Thr Phe Ser Ala			
625	630	635	640

Arg Asn Leu Asp Phe Gln Ala Leu Arg Thr Asp Trp Ile Asp Leu Ser
645 650 655

Cys Asn Thr Ser Gly Asn Leu Leu Leu Pro Glu Gln Glu Ala Leu Glu
660 665 670

Val Thr Arg Val Phe Leu Lys Lys Leu Asn Gln Arg Ser Arg Gly Arg
675 680 685

Tyr Gln Leu Gln Arg Ile Val Asn Val Glu Lys Arg Gln Asp Gln Leu
690 695 700

Arg Gly Gly Arg Tyr Leu Leu Glu Leu Glu Leu Leu Glu Gln Gly Gln
705 710 715 720

Arg Val Val Arg Leu Ser Glu Tyr Val Ser Ala Arg Gly Trp Gln Gly
725 730 735

Ile Asp Pro Ala Gly Gly Glu Glu Val Glu Ala Arg Asn Leu Gln Gly
740 745 750

Leu Val Trp Asp Pro His Asn Arg Arg Arg Gln Val Leu Asn Thr Arg
755 760 765

Ala Gln Glu Pro Lys Leu Cys Trp Pro Gln Gly Phe Ser Trp Ser His
770 775 780

Arg Ala Val Val His Phe Val Val Pro Val Lys Asn Gln Ala Arg Trp
785 790 795 800

Val Gln Gln Phe Ile Lys Asp Met Glu Asn Leu Phe Gln Val Thr Gly
805 810 815

Asp Pro His Phe Asn Ile Val Ile Thr Asp Tyr Ser Ser Glu Asp Met
820 825 830

Asp Val Glu Met Ala Leu Lys Arg Ser Lys Leu Arg Ser Tyr Gln Tyr
835 840 845

Val Lys Leu Ser Gly Asn Phe Glu Arg Ser Ala Gly Leu Gln Ala Gly
850 855 860

Ile Asp Leu Val Lys Asp Pro His Ser Ile Ile Phe Leu Cys Asp Leu
865 870 875 880

His Ile His Phe Pro Ala Gly Val Ile Asp Ala Ile Arg Lys His Cys
885 890 895

Val Glu Gly Lys Met Ala Phe Ala Pro Met Val Met Arg Leu His Cys
900 905 910

Gly Ala Thr Pro Gln Trp Pro Glu Gly Tyr Trp Glu Val Asn Gly Phe
915 920 925

Gly Leu Leu Gly Ile Tyr Lys Ser Asp Leu Asp Arg Ile Gly Gly Met
930 935 940

Asn Thr Lys Glu Phe Arg Asp Arg Trp Gly Gly Glu Asp Trp Glu Leu

945 950 955 960

Leu Asp Arg Ile Leu Gln Ala Gly Leu Asp Val Glu Arg Leu Ser Leu

965 970 975

Arg Asn Phe Phe His His Phe His Ser Lys Arg Gly Met Trp Ser Arg

980 985 990

Arg Gln Met Lys Thr Leu

995 998

<210> 4

<211> 2997

<212> DNA

<213> Homo sapiens

<400> 4

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1 5 10 15

aag ctg ctg cgg agg cgc ttc cgg ctg ctg ctg gcg ctc gcc gtg gtg 96

Lys Leu Leu Arg Arg Arg Phe Arg Leu Leu Leu Ala Leu Ala Val Val

20 25 30

tct gtg ggg ctc tgg act ctg tat ctg gaa ctg gtg gcg tgc gcc cag 144

Ser Val Gly Leu Trp Thr Leu Tyr Leu Glu Leu Val Ala Ser Ala Gln

35 40 45

gtc ggc ggg aac ccc ctg aac cgg agg tac ggc agc tgg aga gaa cta 192
Val Gly Gly Asn Pro Leu Asn Arg Arg Tyr Gly Ser Trp Arg Glu Leu
50 55 60

gcc aag gct ctg gcc agc agg aac att cca gct gtg gat cca cac ctc 240
Ala Lys Ala Leu Ala Ser Arg Asn Ile Pro Ala Val Asp Pro His Leu
65 70 75 80

cag ttc tac cat ccc cag agg ctg agc ctc gag gac cac gac att gac 288
Gln Phe Tyr His Pro Gln Arg Leu Ser Leu Glu Asp His Asp Ile Asp
85 90 95

caa ggg gtg agc agt aac agc agc tac ttg aag tgg aac aag cct gtc 336
Gln Gly Val Ser Ser Asn Ser Ser Tyr Leu Lys Trp Asn Lys Pro Val
100 105 110

ccc tgg ctc tca gag ttc cgg ggc cgt gcc aac ctg cat gtg ttt gaa 384
Pro Trp Leu Ser Glu Phe Arg Gly Arg Ala Asn Leu His Val Phe Glu
115 120 125

gac tgg tgt ggc agc tct atc cag cag ctc agg agg aac ctg cat ttc 432
Asp Trp Cys Gly Ser Ser Ile Gln Gln Leu Arg Arg Asn Leu His Phe
130 135 140

cca ctg tac ccc cat att cgc aca acc ctg agg aag ctt gct gtg tcc 480
Pro Leu Tyr Pro His Ile Arg Thr Thr Leu Arg Lys Leu Ala Val Ser
145 150 155 160

ccc aaa tgg acc aac tat ggc ctc cgc atc ttt ggc tac ctg cac ccc	528
Pro Lys Trp Thr Asn Tyr Gly Leu Arg Ile Phe Gly Tyr Leu His Pro	
165 170 175	
ttt act gat ggg aaa atc cag ttt gcc att gct gca gat gac aac gcg	576
Phe Thr Asp Gly Lys Ile Gln Phe Ala Ile Ala Ala Asp Asp Asn Ala	
180 185 190	
gag ttc tgg ctg agc ctc gat gac cag gtc tca ggc ctc cag ctg ctg	624
Glu Phe Trp Leu Ser Leu Asp Asp Gln Val Ser Gly Leu Gln Leu Leu	
195 200 205	
gcc agt gtg ggc aag act gga aag gag tgg acc gcc ccg gga gag ttt	672
Ala Ser Val Gly Lys Thr Gly Lys Glu Trp Thr Ala Pro Gly Glu Phe	
210 215 220	
ggg aaa ttt cgg agc caa att tcc aag ccg gtg agc ctg tca gcc tcc	720
Gly Lys Phe Arg Ser Gln Ile Ser Lys Pro Val Ser Leu Ser Ala Ser	
225 230 235 240	
cac agg tac tac ttc gag gtg ctg cac aag cag aat gag gag ggc acc	768
His Arg Tyr Tyr Phe Glu Val Leu His Lys Gln Asn Glu Glu Gly Thr	
245 250 255	
gac cac gtg gaa gtt gca tgg cga cgg aac gac cct gga gcc aag ttc	816
Asp His Val Glu Val Ala Trp Arg Arg Asn Asp Pro Gly Ala Lys Phe	
260 265 270	
acc atc att gac tcc ctc tcc ctg tcc ctc ttc aca aat gag acg ttc	864

Thr Ile Ile Asp Ser Leu Ser Leu Ser Leu Phe Thr Asn Glu Thr Phe
275 280 285

cta cag atg gat gag gtg ggc cac atc cca cag aca gca gcc agc cac 912
Leu Gln Met Asp Glu Val Gly His Ile Pro Gln Thr Ala Ala Ser His
290 295 300

gtg gac tcc tcc aac gct ctt ccc agg gat gag cag ccg ccc gct gac 960
Val Asp Ser Ser Asn Ala Leu Pro Arg Asp Glu Gln Pro Pro Ala Asp
305 310 315 320

atg ctt cgg cct gac ccc cgg gac acc ctc tat cga gtg cct ctg atc 1008
Met Leu Arg Pro Asp Pro Arg Asp Thr Leu Tyr Arg Val Pro Leu Ile
325 330 335

ccc aag tcg cat ctc cgc cac gtc ctg cct gac tgt ccc tac aaa ccc 1056
Pro Lys Ser His Leu Arg His Val Leu Pro Asp Cys Pro Tyr Lys Pro
340 345 350

agc tat ctg gtg gat ggg ctt cct ctg cag cgc tac cag gga ctc cgg 1104
Ser Tyr Leu Val Asp Gly Leu Pro Leu Gln Arg Tyr Gln Gly Leu Arg
355 360 365

ttt gtt cat ctg tct ttt gtt tac ccc aat gac tat acc cgc ctg agc 1152
Phe Val His Leu Ser Phe Val Tyr Pro Asn Asp Tyr Thr Arg Leu Ser
370 375 380

cac atg gag acc cac aat aaa tgt ttc tac cag gaa aac gcc tac tac 1200
His Met Glu Thr His Asn Lys Cys Phe Tyr Gln Glu Asn Ala Tyr Tyr

385	390	395	400	
caa gac cgg ttc agc ttt cag gag tac atc agg att gac cag cct gag				1248
Gln Asp Arg Phe Ser Phe Gln Glu Tyr Ile Arg Ile Asp Gln Pro Glu				
	405	410	415	
aag cag ggg ctg gag cag cca ggt ttt gag gaa aac ctt cta gaa gag				1296
Lys Gln Gly Leu Glu Gln Pro Gly Phe Glu Glu Asn Leu Leu Glu Glu				
	420	425	430	
tcc cag tat ggg gaa gtg gca gag gag acc cct gcc tcc aac aac cag				1344
Ser Gln Tyr Gly Glu Val Ala Glu Glu Thr Pro Ala Ser Asn Asn Gln				
	435	440	445	
aat gcc agg atg ctt gag gga aga cag aca cct gcc tcc acc ctg gag				1392
Asn Ala Arg Met Leu Glu Gly Arg Gln Thr Pro Ala Ser Thr Leu Glu				
	450	455	460	
caa gat gcc act gac tac cgc ctc cga agc ctg cgg aaa ctc ctg gct				1440
Gln Asp Ala Thr Asp Tyr Arg Leu Arg Ser Leu Arg Lys Leu Leu Ala				
	465	470	475	480
cag ccc cgg gag ggc ctg ctg gcc ccc ttc tcc aag cgg aac tcc aca				1488
Gln Pro Arg Glu Gly Leu Leu Ala Pro Phe Ser Lys Arg Asn Ser Thr				
	485	490	495	
gcg tcc ttc cca ggg agg acc agc cac att cca gtg cag cag cca gag				1536
Ala Ser Phe Pro Gly Arg Thr Ser His Ile Pro Val Gln Gln Pro Glu				
	500	505	510	

aag agg aag caa aaa ccc agc cct gag ccc agc caa gat tca cct cat 1584
 Lys Arg Lys Gln Lys Pro Ser Pro Glu Pro Ser Gln Asp Ser Pro His
 515 520 525

tcc gac aag tgg cct cct ggg cac cct gtg aag aac ctg cct cag atg 1632
 Ser Asp Lys Trp Pro Pro Gly His Pro Val Lys Asn Leu Pro Gln Met
 530 535 540

agg ggg ccc agg ccc agg ccc gct ggt gac agc ccc agg aag act cag 1680
 Arg Gly Pro Arg Pro Arg Pro Ala Gly Asp Ser Pro Arg Lys Thr Gln
 545 550 555 560

tgg ctg aac cag gtg gag tgg tac atc gca gag cag aga cgg ggt gac 1728
 Trp Leu Asn Gln Val Glu Ser Tyr Ile Ala Glu Gln Arg Arg Gly Asp
 565 570 575

agg atg cgg cct cag gcc ccc gga agg ggc tgg cat ggg gag gag gaa 1776
 Arg Met Arg Pro Gln Ala Pro Gly Arg Gly Trp His Gly Glu Glu Glu
 580 585 590

gtg gtg gcg gcc gca ggc cag gaa gga caa gtg gag gga gag gaa gag 1824
 Val Val Ala Ala Ala Gly Gln Glu Gly Gln Val Glu Gly Glu Glu Glu
 595 600 605

ggg gaa gaa gag gag gag gaa gag gat atg agt gag gtg ttc gag tac 1872
 Gly Glu Glu Glu Glu Glu Glu Glu Asp Met Ser Glu Val Phe Glu Tyr
 610 615 620

gta cct gig ttt gac ccg gta gta aac tgg gac cag acc ttc agt gcc 1920
Val Pro Val Phe Asp Pro Val Val Asn Trp Asp Gln Thr Phe Ser Ala
625 630 635 640

cgg aat ctc gac ttc caa gcc ctg agg act gac tgg atc gat ctg agc 1968
Arg Asn Leu Asp Phe Gln Ala Leu Arg Thr Asp Trp Ile Asp Leu Ser
645 650 655

tgt aac aca tct ggc aac ctg ctg ctt cca gag cag gaa gct ctg gag 2016
Cys Asn Thr Ser Gly Asn Leu Leu Leu Pro Glu Gln Glu Ala Leu Glu
660 665 670

gtc acg cga gtc ttc ttg aag aag ctc aac cag agg agc cgg ggg agg 2064
Val Thr Arg Val Phe Leu Lys Lys Leu Asn Gln Arg Ser Arg Gly Arg
675 680 685

tac cag cta cag cgc att gtg aac gtg gaa aag cgt cag gac cag cta 2112
Tyr Gln Leu Gln Arg Ile Val Asn Val Glu Lys Arg Gln Asp Gln Leu
690 695 700

cgt ggg ggt cgc tac ctc ctg gag ctt gaa ctg ttg gaa caa ggc cag 2160
Arg Gly Gly Arg Tyr Leu Leu Glu Leu Glu Leu Leu Glu Gln Gly Gln
705 710 715 720

cgc gtg gtg cgg ctc tcg gag tat gtg tct gca cga ggc tgg cag ggc 2208
Arg Val Val Arg Leu Ser Glu Tyr Val Ser Ala Arg Gly Trp Gln Gly
725 730 735

atc gat cca gct ggt ggg gag gag gtc gag gcc cgg aac ctg caa ggc 2256

Ile Asp Pro Ala Gly Gly Glu Glu Val Glu Ala Arg Asn Leu Gln Gly

740

745

750

ctg gtc tgg gac cca cac aac cgt agg aga cag gtc ctg aat acc cgg 2304

Leu Val Trp Asp Pro His Asn Arg Arg Arg Gln Val Leu Asn Thr Arg

755

760

765

gcc caa gag ccc aag ctg tgc tgg cct cag ggt ttc tcc tgg agt cac 2352

Ala Gln Glu Pro Lys Leu Cys Trp Pro Gln Gly Phe Ser Trp Ser His

770

775

780

cga gcc gtg gtc cac ttc gtc gtg cct gtg aag aac cag gca cgc tgg 2400

Arg Ala Val Val His Phe Val Val Pro Val Lys Asn Gln Ala Arg Trp

785

790

795

800

gta cag caa ttc atc aaa gac atg gaa aac ctg ttc cag gtc acc ggt 2448

Val Gln Gln Phe Ile Lys Asp Met Glu Asn Leu Phe Gln Val Thr Gly

805

810

815

gac cca cac ttc aac atc gtc atc act gac tat agc agt gag gac atg 2496

Asp Pro His Phe Asn Ile Val Ile Thr Asp Tyr Ser Ser Glu Asp Met

820

825

830

gat gtt gag atg gca ctg aag agg tcc aag ctg cgg agc tac cag tac 2544

Asp Val Glu Met Ala Leu Lys Arg Ser Lys Leu Arg Ser Tyr Gln Tyr

835

840

845

gtg aag cta agt gga aac ttt gaa cgc tca gct gga ctt cag gct ggc 2592

Val Lys Leu Ser Gly Asn Phe Glu Arg Ser Ala Gly Leu Gln Ala Gly

850	855	860	
ata gac ctc gtg aag gac ccg cac agc atc atc ttc ctc tgt gac ctc			2640
Ile Asp Leu Val Lys Asp Pro His Ser Ile Ile Phe Leu Cys Asp Leu			
865	870	875	880
cac atc cac ttc cca gct gga gtc atc gat gcc att cgg aag cac tgt			2688
His Ile His Phe Pro Ala Gly Val Ile Asp Ala Ile Arg Lys His Cys			
	885	890	895
gtg gag gga aag atg gcc ttt gcc ccc atg gtg atg agg ctg cat tgt			2736
Val Glu Gly Lys Met Ala Phe Ala Pro Met Val Met Arg Leu His Cys			
	900	905	910
ggg gcc acc ccc cag tgg cct gag ggc tac tgg gag gtg aat ggg ttc			2784
Gly Ala Thr Pro Gln Trp Pro Glu Gly Tyr Trp Glu Val Asn Gly Phe			
	915	920	925
ggg ctg ctt ggc atc tac aag tct gac ctg gac agg att ggg ggc atg			2832
Gly Leu Leu Gly Ile Tyr Lys Ser Asp Leu Asp Arg Ile Gly Gly Met			
	930	935	940
aac acc aag gag ttc cga gac cgc tgg ggc ggg gaa gac tgg gag ctg			2880
Asn Thr Lys Glu Phe Arg Asp Arg Trp Gly Gly Glu Asp Trp Glu Leu			
945	950	955	960
ctg gac agg ata ctc caa gcg ggc ctg gac gtg gag cgt ctc tcc ctc			2928
Leu Asp Arg Ile Leu Gln Ala Gly Leu Asp Val Glu Arg Leu Ser Leu			
	965	970	975

agg aat ttc ttc cat cat ttc cat tcc aag cga ggc atg tgg agc cgt 2976

Arg Asn Phe Phe His His Phe His Ser Lys Arg Gly Met Trp Ser Arg

980

985

990

cgc cag atg aag acg ctg tag

2997

Arg Gln Met Lys Thr Leu

995

998

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<211> 21

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<213> Artificial Sequence

<220>

<223> Oligonucleotide primer used in PCR for cloning GalNAc-T1 cDNA

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<210> 6

<211> 22

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<213> Artificial Sequence

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<400> 6

aagcgactcc ctgcgccga gt 22

<210> 7

<211> 24

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<400> 7

atgccgcggc tcccggtgaa gaag 24

<210> 8

<211> 24

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T2 cDNA

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ccacagttca agctccagga ggta 24

<210> 9

<211> 24

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T2 cDNA

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<210> 10

<211> 22

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T2 cDNA

<400> 10

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<210> 11

<211> 21

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T2 cDNA

<400> 11

gtcttcctgg ggctgtcacc a 21

<210> 12

<211> 24

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T2 cDNA

<400> 12

cacctcatcc atctgtagga acgt 24

<210> 13

<211> 23

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T2 cDNA

<400> 13

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<210> 14

<211> 23

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T2 cDNA

<400> 14

aatgtcgtgg tcctcgaggc tca 23

<210> 15

<211> 24

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T2 cDNA

<400> 15

gatggtagaa ctggaggtgt ggat 24

<210> 16

<211> 31

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T1 cDNA

<400> 16

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<210> 17

<211> 30

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T1 cDNA

<400> 17

gctctagact caagacgccc ccgtgcgaga 30

<210> 18

<211> 29

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T2 cDNA

<400> 18

ggaattcgag gtacggcagc tggagagaa 29

<210> 19

<211> 32

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for cloning GalNAc-T2 cDNA

<400> 19

acgcgtcgac ctacagcgtc ttcattctggc ga

<210> 20

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<213> Artificial Sequence

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ctggctggatt tcgagagcga 20

<210> 21

<211> 18

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for amplifying GalNAc-T1 cDNA

<400> 21

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<210> 22

<211> 15

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide probe used in PCR for detecting GalNAc-T1 cDNA

<400> 22

gcggttagagg acgcc 15

<210> 23

<211> 26

<212> DNA

<213> Artificial Sequence

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<223> Oligonucleotide primer used in PCR for amplifying GalNAc-T2 cDNA

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<210> 24

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<223> Oligonucleotide primer used in PCR for amplifying GalNAc-T2 cDNA

<400> 24

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<210> 25

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<213> Artificial Sequence

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<223> Oligonucleotide probe used in PCR for detecting GalNAc-T2 cDNA

<400> 25

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<210> 26
<211> 1034
<212> PRT
<213> Mouse

<400> 26

Met Pro Trp Phe Pro Val Lys Lys Val Arg Lys Gln Met Lys Leu Leu
1 5 10 15

Leu Leu Leu Leu Leu Leu Thr Cys Ala Ala Trp Leu Thr Tyr Val His
20 25 30

Arg Ser Leu Val Arg Pro Gly Arg Ala Leu Arg Gln Arg Leu Gly Tyr
35 40 45

Gly Arg Asp Gly Glu Lys Leu Thr Gly Val Thr Asp Ser Arg Gly Val
50 55 60

Arg Val Pro Ser Ser Thr Gln Arg Ser Glu Asp Ser Ser Glu Ser His
65 70 75 80

Glu Glu Glu Gln Ala Pro Glu Gly Arg Gly Pro Asn Met Leu Phe Pro
85 90 95

Gly Gly Pro Arg Lys Pro Pro Pro Leu Asn Leu Thr His Gln Thr Pro
100 105 110

Pro Trp Arg Glu Glu Phe Lys Gly Gln Val Asn Leu His Val Phe Glu

115	120	125
Asp Trp Cys Gly Gly Ala Val Gly His Leu Arg Arg Asn Leu His Phe		
130	135	140
Pro Leu Phe Pro His Thr Arg Thr Thr Val Thr Lys Leu Ala Val Ser		
145	150	155
Pro Lys Trp Lys Asn Tyr Gly Leu Arg Ile Phe Gly Phe Ile His Pro		
165	170	175
Ala Arg Asp Gly Asp Ile Gln Phe Ser Val Ala Ser Asp Asp Asn Ser		
180	185	190
Glu Phe Trp Leu Ser Leu Asp Glu Ser Pro Ala Ala Ala Gln Leu Val		
195	200	205
Ala Phe Val Gly Lys Thr Gly Ser Glu Trp Thr Ala Pro Gly Glu Phe		
210	215	220
Thr Lys Phe Ser Ser Gln Val Ser Lys Pro Arg Arg Leu Met Ala Ser		
225	230	235
Arg Arg Tyr Tyr Phe Glu Leu Leu His Lys Gln Asp Asp Lys Gly Ser		
245	250	255
Asp His Val Glu Val Gly Trp Arg Ala Phe Leu Pro Gly Leu Lys Phe		
260	265	270

Glu Ile Ile Asp Ser Ala His Ile Ser Leu Tyr Thr Asp Glu Ser Ser
275 280 285

Leu Lys Met Asp His Val Ala His Val Pro Gln Ser Pro Ala Ser His
290 195 300

Ile Gly Gly Phe Pro Pro Gln Gly Glu Pro Ser Ala Asp Met Leu His
305 310 315 320

Pro Asp Pro Arg Asp Thr Phe Phe Leu Thr Pro Arg Met Glu Pro Leu
325 330 335

Ser Leu Glu Asn Val Leu Glu Pro Cys Ala Tyr Ala Pro Thr Tyr Ile
340 345 350

Leu Lys Asp Phe Pro Ile Ala Arg Tyr Gln Gly Leu Gln Phe Val Tyr
355 360 365

Leu Ser Phe Ile Tyr Pro Asn Asp His Thr Arg Leu Thr His Met Glu
370 375 380

Thr Asp Asn Lys Cys Phe Tyr Arg Glu Ser Pro Leu Tyr Leu Glu Arg
385 390 395 400

Phe Gly Phe Tyr Lys Tyr Met Lys Met Asp Lys Glu Glu Gly Glu Glu
405 410 415

Asp Glu Glu Glu Glu Val Gln Arg Arg Ala Phe Leu Phe Leu Asn Pro
420 425 430

Asp Asp Phe Leu Asp Glu Glu Asp Glu Gln Asp Leu Leu Asp Ser Leu
435 440 445

Glu Pro Thr Asp Ala Ser Val Gln Gln Ser His Arg Thr Pro Thr Pro
450 455 460

Ala Ala Ser Thr Gly Thr Thr Ala Ser Pro Thr Pro Pro Thr Thr Ser
465 470 475 480

Pro Leu Asp Glu Gln Thr Leu Arg His Ser Arg Ala Leu Asn Trp Ala
485 490 495

Pro Arg Pro Leu Pro Leu Phe Leu Gly Arg Ala Pro Pro Pro Arg Thr
500 505 510

Val Glu Lys Ser Pro Ser Lys Val Tyr Val Thr Arg Val Arg Pro Gly
515 520 525

Gln Arg Ala Ser Pro Arg Ala Leu Arg Asp Ser Pro Trp Pro Pro Phe
530 535 540

Pro Gly Val Phe Leu Arg Pro Lys Pro Leu Pro Arg Val Gln Leu Arg
545 550 555 560

Val Pro Pro His Pro Pro Arg Thr Gln Gly Tyr Arg Thr Ser Gly Pro
565 570 575

Lys Val Thr Glu Leu Lys Pro Pro Val Arg Ala Gln Thr Ser Gln Gly

580	585	590
Gly Arg Glu Gly Gln Leu His Gly Gln Gly Leu Met Val Pro Thr Val		
595	600	605
Asp Leu Asn Ser Ser Val Glu Thr Gln Pro Val Thr Ser Phe Leu Ser		
610	615	620
Leu Ser Gln Val Ser Arg Pro Gln Leu Pro Gly Glu Gly Glu Glu Gly		
625	630	635 640
Glu Glu Asp Gly Ala Pro Gly Asp Glu Ala Thr Ser Glu Asp Ser Glu		
645	650	655
Glu Glu Glu Glu Pro Ala Ala Gly Arg Pro Leu Gly Arg Trp Arg Glu		
660	665	670
Asp Ala Ile Asn Trp Gln Arg Thr Phe Ser Val Gly Ala Met Asp Phe		
675	680	685
Glu Leu Leu Arg Ser Asp Trp Asn Asp Leu Arg Cys Asn Val Ser Gly		
690	695	700
Asn Leu Gln Leu Pro Glu Ala Glu Ala Val Asp Val Val Ala Gln Tyr		
705	710	715 720
Met Glu Arg Leu Asn Ala Lys His Gly Gly Arg Phe Ser Leu Leu Arg		
725	730	735

Ile Val Asn Val Glu Lys Arg Arg Asp Ser Ala Arg Gly Ser Arg Phe
740 745 750

Leu Leu Glu Leu Glu Leu Gln Glu Arg Gly Gly Ser Arg Gln Arg Leu
755 760 765

Ser Glu Tyr Val Phe Leu Arg Leu Pro Gly Ala Arg Val Gly Asp Glu
770 775 780

Asp Gly Glu Ser Pro Glu Pro Pro Pro Ala Ala Ser Ile His Pro Asp
785 790 795 800

Ser Arg Pro Glu Leu Cys Arg Pro Leu His Leu Ala Trp Arg Gln Asp
805 810 815

Val Met Val His Phe Ile Val Pro Val Lys Asn Gln Ala Arg Trp Val
820 825 830

Val Gln Phe Leu Ala Asp Met Thr Ala Leu His Val His Thr Gly Asp
835 840 845

Ser Tyr Phe Asn Ile Ile Leu Val Asp Phe Glu Ser Glu Asp Met Asp
850 855 860

Val Glu Arg Ala Leu Arg Ala Ala Gln Leu Pro Arg Tyr Gln Tyr Leu
865 870 875 880

Lys Arg Thr Gly Asn Phe Glu Arg Ser Ala Gly Leu Gln Thr Gly Val
885 890 895

Asp Ala Val Glu Asp Pro Ser Ser Ile Val Phe Leu Cys Asp Leu His

900

905

910

Ile His Phe Pro Pro Asn Ile Leu Asp Ser Ile Arg Lys His Cys Val

915

920

925

Glu Gly Lys Leu Ala Phe Ala Pro Val Val Met Arg Leu Gly Cys Gly

930

935

940

Ser Ser Pro Trp Asp Pro His Gly Tyr Trp Glu Val Asn Gly Phe Gly

945

950

955

960

Leu Phe Gly Ile Tyr Lys Ser Asp Phe Asp Arg Val Gly Gly Met Asn

965

970

975

Thr Glu Glu Phe Arg Asp Gln Trp Gly Gly Glu Asp Trp Glu Leu Leu

980

985

990

Asp Arg Val Leu Gln Ala Gly Leu Glu Val Glu Arg Leu Arg Leu Arg

995

1000

1005

His Phe Tyr His His Tyr His Ser Lys Arg Gly Met Trp Ala Thr Arg

1010

1015

1020

Ser Arg Lys Gly Ala Arg Ala Gln Arg Ser

1025

1030

<210> 27
 <211> 3105
 <212> DNA
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<400> 27

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 Met Pro Trp Phe Pro Val Lys Lys Val Arg Lys Gln Met Lys Leu Leu
 1 5 10 15

ctg ctg ttg ctg ctg ctc acc tgc gcc gcg tgg ctc acg tat gtg cac 96
 Leu Leu Leu Leu Leu Leu Thr Cys Ala Ala Trp Leu Thr Tyr Val His
 20 25 30

cgg agc ctg gtg cgc ccg ggc cgc gcg cta cgc cag cgg ctg ggc tac 144
 Arg Ser Leu Val Arg Pro Gly Arg Ala Leu Arg Gln Arg Leu Gly Tyr
 35 40 45

ggg cga gat ggg gag aag ctg acc ggt gtg acc gat agc cgc gga gtc 192
 Gly Arg Asp Gly Glu Lys Leu Thr Gly Val Thr Asp Ser Arg Gly Val
 50 55 60

cga gtg cca tgc tcc aca cag agg tgc gag gac tgc agt gaa agt cat 240
 Arg Val Pro Ser Ser Thr Gln Arg Ser Glu Asp Ser Ser Glu Ser His
 65 70 75 80

gaa gag gag cag gcg ccc gag ggg cgg ggc cca aac atg ctg ttt cct 288
 Glu Glu Glu Gln Ala Pro Glu Gly Arg Gly Pro Asn Met Leu Phe Pro
 85 90 95

gga gga cct agg aag cca ccc cca ctg aac ctc acc cac cag aca ccc 336
 Gly Gly Pro Arg Lys Pro Pro Pro Leu Asn Leu Thr His Gln Thr Pro
 100 105 110

cca tgg cgg gaa gag ttc aaa gga cag gtg aac ctg cac gtg ttt gag 384
 Pro Trp Arg Glu Glu Phe Lys Gly Gln Val Asn Leu His Val Phe Glu
 115 120 125

) gac tgg tgt gga ggt gct gtg ggc cac ctg aga cgg aat ctg cac ttc 432
 Asp Trp Cys Gly Gly Ala Val Gly His Leu Arg Arg Asn Leu His Phe
 130 135 140

cca ctc ttt cct cac act cgt act acg gtg aca aag tta gct gtg tcc 480
 Pro Leu Phe Pro His Thr Arg Thr Thr Val Thr Lys Leu Ala Val Ser
 145 150 155 160

cct aag tgg aag aac tat gga ctc cgg att ttt ggc ttc atc cac cca 528
 Pro Lys Trp Lys Asn Tyr Gly Leu Arg Ile Phe Gly Phe Ile His Pro
 165 170 175

) gcc aga gat gga gac atc cag ttc tct gtg gct tcg gat gac aac tct 576
 Ala Arg Asp Gly Asp Ile Gln Phe Ser Val Ala Ser Asp Asp Asn Ser
 180 185 190

gag ttc tgg ctg agt ttg gat gag agc cca gca gcc gcc cag ctt gta 624
 Glu Phe Trp Leu Ser Leu Asp Glu Ser Pro Ala Ala Ala Gln Leu Val
 195 200 205

gcc ttt gtg ggc aag act ggc tcc gag tgg acc gca cct gga gaa ttc 672
Ala Phe Val Gly Lys Thr Gly Ser Glu Trp Thr Ala Pro Gly Glu Phe
210 215 220

acc aag ttc agc tcc cag gtg tct aag cca cgt cgg ctc atg gcc tcc 720
Thr Lys Phe Ser Ser Gln Val Ser Lys Pro Arg Arg Leu Met Ala Ser
225 230 235 240

cgg aga tac tac ttt gaa ctg ctc cac aag caa gat gac aag ggt tca 768
Arg Arg Tyr Tyr Phe Glu Leu Leu His Lys Gln Asp Asp Lys Gly Ser
245 250 255

gac cat gtg gaa gtg ggt tgg cga gct ttc ctg cct ggt ctg aag ttc 816
Asp His Val Glu Val Gly Trp Arg Ala Phe Leu Pro Gly Leu Lys Phe
260 265 270

gag atc att gat tct gct cac att tcc ctg tac aca gat gag tca tct 864
Glu Ile Ile Asp Ser Ala His Ile Ser Leu Tyr Thr Asp Glu Ser Ser
275 280 285

ctg aag atg gac cat gtg gcc cat gtg cct cag tct cca gcc agc cac 912
Leu Lys Met Asp His Val Ala His Val Pro Gln Ser Pro Ala Ser His
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ata gga gga ttc ccg ccg cag ggg gaa ccc agc gcc gac atg ctg cac 960
Ile Gly Gly Phe Pro Pro Gln Gly Glu Pro Ser Ala Asp Met Leu His
305 310 315 320

cca gac ccc agg gat acc ttc ttc ctc act cct cgg atg gaa cct ttg 1008

Pro Asp Pro Arg Asp Thr Phe Phe Leu Thr Pro Arg Met Glu Pro Leu
325 330 335

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Ser Leu Glu Asn Val Leu Glu Pro Cys Ala Tyr Ala Pro Thr Tyr Ile
340 345 350

ctc aag gat ttc ccc ata gcc aga tac caa gga cta cag ttt gtg tac 1104
Leu Lys Asp Phe Pro Ile Ala Arg Tyr Gln Gly Leu Gln Phe Val Tyr
355 360 365

ctg tcc ttc atc tac ccc aat gac cat acc cgt ctc act cac atg gag 1152
Leu Ser Phe Ile Tyr Pro Asn Asp His Thr Arg Leu Thr His Met Glu
370 375 380

aca gac aac aag tgc ttc tac cgt gag tcc cca cta tac ctg gaa agg 1200
Thr Asp Asn Lys Cys Phe Tyr Arg Glu Ser Pro Leu Tyr Leu Glu Arg
385 390 395 400

ttt ggg ttc tat aaa tac atg aaa atg gac aag gag gag gga gag gaa 1248
Phe Gly Phe Tyr Lys Tyr Met Lys Met Asp Lys Glu Glu Gly Glu Glu
405 410 415

gat gag gag gaa gaa gtt cag cgt aga gcc ttc ctc ttc ctc aac cca 1296
Asp Glu Glu Glu Glu Val Gln Arg Arg Ala Phe Leu Phe Leu Asn Pro
420 425 430

gat gac ttc ctg gat gag gag gat gag cag gat ctg tta gac agc ctg 1344
Asp Asp Phe Leu Asp Glu Glu Asp Glu Gln Asp Leu Leu Asp Ser Leu

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Glu Pro Thr Asp Ala Ser Val Gln Gln Ser His Arg Thr Pro Thr Pro			
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Ala Ala Ser Thr Gly Thr Thr Ala Ser Pro Thr Pro Pro Thr Thr Ser			
465	470	475	480
cct ctg gac gag cag acc ctc aga cac tcc cgg gca ctg aat tgg gcc			1488
Pro Leu Asp Glu Gln Thr Leu Arg His Ser Arg Ala Leu Asn Trp Ala			
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cca cgc ccc ctg ccc ctc ttc ttg ggg cga gct cca cct ccc cga act			1536
Pro Arg Pro Leu Pro Leu Phe Leu Gly Arg Ala Pro Pro Pro Arg Thr			
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Val Glu Lys Ser Pro Ser Lys Val Tyr Val Thr Arg Val Arg Pro Gly			
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Gln Arg Ala Ser Pro Arg Ala Leu Arg Asp Ser Pro Trp Pro Pro Phe			
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Pro Gly Val Phe Leu Arg Pro Lys Pro Leu Pro Arg Val Gln Leu Arg			
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Val Pro Pro His Pro Pro Arg Thr Gln Gly Tyr Arg Thr Ser Gly Pro
565 570 575

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Lys Val Thr Glu Leu Lys Pro Pro Val Arg Ala Gln Thr Ser Gln Gly
580 585 590

ggc cgg gag ggc cag tta cat gga cag gga ctc atg gtg ccc aca gtg 1824
Gly Arg Glu Gly Gln Leu His Gly Gln Gly Leu Met Val Pro Thr Val
595 600 605

gac ttg aac tcc tca gtg gaa aca cag cct gtg act tcc ttc ctg agc 1872
Asp Leu Asn Ser Ser Val Glu Thr Gln Pro Val Thr Ser Phe Leu Ser
610 615 620

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625 630 635 640

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645 650 655

gaa gag gag gag ccg gcc gct ggg cgg ccc ctg ggt cgc tgg cgg gag 2016
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660 665 670

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675 680 685	
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Glu Leu Leu Arg Ser Asp Trp Asn Asp Leu Arg Cys Asn Val Ser Gly	
690 695 700	
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Asn Leu Gln Leu Pro Glu Ala Glu Ala Val Asp Val Val Ala Gln Tyr	
705 710 715 720	
atg gag cgg cta aat gca aag cat ggc ggg cgc ttc tcg ctt cta cgc	2208
Met Glu Arg Leu Asn Ala Lys His Gly Gly Arg Phe Ser Leu Leu Arg	
725 730 735	
atc gtg aac gtg gag aag cgc cgc gac tct gca cgc ggg agc cgc ttc	2256
Ile Val Asn Val Glu Lys Arg Arg Asp Ser Ala Arg Gly Ser Arg Phe	
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ctc ctg gaa ctg gaa ttg caa gag cgc gga ggg agc cgc cag cgc cta	2304
Leu Leu Glu Leu Glu Leu Gln Glu Arg Gly Gly Ser Arg Gln Arg Leu	
755 760 765	
tcc gaa tac gtc ttc ctg cgg ttg ccc gga gcc cgc gtt ggg gac gaa	2352
Ser Glu Tyr Val Phe Leu Arg Leu Pro Gly Ala Arg Val Gly Asp Glu	
770 775 780	
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900	905	910	
atc cac ttc cca cct aat atc ctg gac agc atc cgc aag cat tgc gtg			2784
Ile His Phe Pro Pro Asn Ile Leu Asp Ser Ile Arg Lys His Cys Val			
915	920	925	
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Glu Gly Lys Leu Ala Phe Ala Pro Val Val Met Arg Leu Gly Cys Gly			
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agc tca ccg tgg gac cca cat ggt tac tgg gaa gtg aat gga ttt ggc			2880
Ser Ser Pro Trp Asp Pro His Gly Tyr Trp Glu Val Asn Gly Phe Gly			
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ctc ttt ggg atc tac aaa tca gac ttt gac aga gta gga ggc atg aac			2928
Leu Phe Gly Ile Tyr Lys Ser Asp Phe Asp Arg Val Gly Gly Met Asn			
965	970	975	
act gag gag ttc cgt gac cag tgg gga ggc gag gac tgg gaa ctt ctt			2976
Thr Glu Glu Phe Arg Asp Gln Trp Gly Gly Glu Asp Trp Glu Leu Leu			
980	985	990	
gac agg gtc ctg cag gca ggg ctg gag gtg gag agg ctt cga ctg cga			3024
Asp Arg Val Leu Gln Ala Gly Leu Glu Val Glu Arg Leu Arg Leu Arg			
995	1000	1005	
cac ttc tac cac cac tat cac tcg aag cga ggc atg tgg gcc aca cgc			3072
His Phe Tyr His His Tyr His Ser Lys Arg Gly Met Trp Ala Thr Arg			
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1030

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Lys Leu Leu Arg Arg Arg Phe Arg Leu Leu Leu Leu Leu Ala Val Val

20

25

30

Ser Val Gly Leu Trp Thr Leu Tyr Leu Glu Leu Val Ala Ser Ala Gln

35

40

45

Ala Gly Gly Asn Pro Leu Asn His Arg Tyr Gly Ser Trp Arg Glu Leu

50

55

60

Ala Lys Ala Leu Ala Ser Arg Asn Ile Pro Ala Val Asp Pro Asn Leu

65

70

75

80

Gln Phe Tyr Arg Pro Gln Arg Leu Ser Leu Lys Asp Gln Glu Ile Ala

85

90

95

Arg Ser Arg Ser Arg Asn Ser Ser Tyr Leu Lys Trp Asn Lys Pro Val

100

105

110

Pro Trp Leu Ser Glu Phe Arg Gly His Ala Asn Leu His Val Phe Glu

115

120

125

Asp Trp Cys Gly Ser Ser Ile Gln Gln Leu Arg Asn Asn Leu His Phe

130

135

140

Pro Leu Tyr Pro His Ile Arg Thr Thr Leu Arg Lys Leu Ala Val Ser

145

150

155

160

Pro Lys Trp Thr Asn Tyr Gly Leu Arg Ile Phe Gly Tyr Leu His Pro

165

170

175

Phe Thr Asp Gly Lys Ile Gln Phe Ala Ile Ala Ala Asp Asp Asn Ala

180

185

190

Glu Phe Trp Leu Ser Arg Asp Asp Gln Val Ser Gly Leu Gln Leu Leu

195

200

205

Ala Ser Val Gly Lys Thr Gly Lys Glu Trp Thr Ala Pro Gly Glu Phe

210

215

220

Gly Lys Phe Gln Ser Gln Ile Ser Lys Pro Val Ser Leu Ser Ala Ser

225

230

235

240

Leu Arg Tyr Tyr Phe Glu Val Leu His Lys Gln Asn Asp Glu Gly Thr

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Asp His Val Glu Val Ala Trp Arg Arg Asn Asp Pro Gly Ala Lys Phe					
	260		265		270
Thr Ile Ile Asp Ser Pro Phe Leu Ser Leu Phe Thr Asn Glu Thr Ile					
	275		280		285
Leu Arg Met Asp Glu Val Gly His Ile Pro Gln Thr Ala Ala Ser His					
	290		295		300
Val Gly Ser Ser Asn Thr Pro Pro Arg Asp Glu Gln Pro Pro Ala Asp					
	305		310		315 320
Met Leu Arg Pro Asp Pro Arg Asp Thr Leu Phe Arg Val Pro Leu Ile					
		325		330	335
Ala Lys Ser His Leu Arg His Val Leu Pro Asp Cys Pro Tyr Lys Pro					
	340		345		350
Ser Tyr Leu Val Asp Gly Leu Pro Leu Gln Arg Tyr Gln Gly Leu Arg					
	355		360		365
Phe Val His Leu Ser Phe Val Tyr Pro Asn Asp Tyr Thr Arg Leu Ser					
	370		375		380
His Met Glu Thr His Asn Lys Cys Phe Tyr Gln Glu Ser Ala Tyr Asp					
	385		390		395 400

Gln Asp Arg Ser Ser Phe Gln Glu Tyr Ile Lys Met Asp Lys Pro Glu
 405 410 415

Lys His Gly Pro Glu Gln Pro Ala Gly Leu Glu Asp Gly Leu Leu Glu
 420 425 430

Glu Ser Gln Tyr Glu Asp Val Pro Glu Glu Ile Pro Thr Ser Gln Asp
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Gln Asn Thr Gly Ile Gln Gly Arg Lys Gln Lys Thr Ile Ser Thr Pro
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Gly Leu Gly Val Thr Asp Tyr His Leu Arg Lys Leu Leu Ala Arg Ser
 465 470 475 480

Gln Ser Gly Pro Val Ala Pro Leu Ser Lys Gln Asn Ser Thr Thr Ala
 485 490 495

Phe Pro Thr Arg Thr Ser Asn Ile Pro Val Gln Arg Pro Glu Lys Ser
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Pro Val Pro Ser Arg Asp Leu Ser His Ser Asp Gln Gly Ala Arg Arg
 515 520 525

Asn Leu Pro Leu Ile Gln Arg Ala Arg Pro Thr Gly Asp Arg Pro Gly
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Lys Thr Leu Glu Gln Ser Gln Trp Leu Asn Gln Val Glu Ser Phe Ile
 545 550 555 560

Ala Glu Gln Arg Arg Gly Asp Arg Ile Glu Pro Pro Thr Pro Ser Arg

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570

575

Gly Trp Arg Pro Glu Glu Asp Val Val Ile Ala Ala Asp Gln Glu Gly

580

585

590

Glu Val Glu Glu Glu Glu Glu Gly Glu Asp Glu Glu Glu Asp Met Ser

595

600

605

Glu Val Phe Glu Tyr Val Pro Met Phe Asp Pro Val Val Asn Trp Gly

610

615

620

Gln Thr Phe Ser Ala Gln Asn Leu Asp Phe Gln Ala Leu Arg Thr Asp

625

630

635

640

Trp Ile Asp Leu Asn Cys Asn Thr Ser Gly Asn Leu Leu Leu Pro Glu

645

650

655

Gln Glu Ala Leu Glu Val Thr Arg Val Phe Leu Arg Lys Leu Ser Gln

660

665

670

Arg Thr Arg Gly Arg Tyr Gln Leu Gln Arg Ile Val Asn Val Glu Lys

675

680

685

Arg Gln Asp Arg Leu Arg Gly Gly Arg Tyr Phe Leu Glu Leu Glu Leu

690

695

700

Leu Asp Gly Gln Arg Leu Val Arg Leu Ser Glu Tyr Val Ser Thr Arg

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Gly Trp Arg Gly Gly Asp His Pro Gly Arg Glu Asp Thr Glu Ala Arg
725 730 735

Asn Leu Gln Gly Leu Val Trp Ser Pro Arg Asn Arg His Arg His Val
740 745 750

Leu Asn Ala Gln Asp Pro Glu Pro Lys Leu Cys Trp Pro Gln Gly Phe
755 760 765

Ser Trp Asn His Arg Ala Val Val His Phe Ile Val Pro Val Lys Asn
770 775 780

Gln Ala Arg Trp Val Gln Gln Phe Ile Arg Asp Met Glu Ser Leu Ser
785 790 795 800

Gln Val Thr Gly Asp Ala His Phe Ser Ile Ile Ile Thr Asp Tyr Ser
805 810 815

Ser Glu Asp Met Asp Val Glu Met Ala Leu Lys Arg Ser Arg Leu Arg
820 825 830

Ser Tyr Gln Tyr Leu Lys Leu Ser Gly Asn Phe Glu Arg Ser Ala Gly
835 840 845

Leu Gln Ala Gly Ile Asp Leu Val Lys Asp Pro His Ser Ile Ile Phe
850 855 860

Leu Cys Asp Leu His Ile His Phe Pro Ala Gly Ile Ile Asp Thr Ile
865 870 875 880

Arg Lys His Cys Val Glu Gly Lys Met Ala Phe Ala Pro Met Val Met
885 890 895

Arg Leu His Cys Gly Ala Thr Pro Gln Trp Pro Glu Gly Tyr Trp Glu
900 905 910

Val Asn Gly Phe Gly Leu Leu Gly Ile Tyr Lys Ser Asp Leu Asp Lys
915 920 925

Ile Gly Gly Met Asn Thr Lys Glu Phe Arg Asp Arg Trp Gly Gly Glu
930 935 940

Asp Trp Glu Leu Leu Asp Arg Ile Leu Gln Ala Gly Leu Glu Val Glu
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aag ctg ctg agg agg cgc ttc cgg ctg ctg ctg ctg ctc gcc gta gta 96
Lys Leu Leu Arg Arg Arg Phe Arg Leu Leu Leu Leu Leu Ala Val Val
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tcg gtg gga ctc tgg act ctg tat ctg gag ctg gtg gcg tcg gcc cag 144
Ser Val Gly Leu Trp Thr Leu Tyr Leu Glu Leu Val Ala Ser Ala Gln
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gcc gcc ggg aac ccc ctg aac cac agg tat gcc agc tgg cga gaa ctg 192
Ala Gly Gly Asn Pro Leu Asn His Arg Tyr Gly Ser Trp Arg Glu Leu
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gcc aag gcc cta gcc agc agg aac atc cca gcc gtt gat ccg aat ctc 240
Ala Lys Ala Leu Ala Ser Arg Asn Ile Pro Ala Val Asp Pro Asn Leu
65 70 75 80

caa ttc tac cgt ccc cag cgg ctg agc ctc aag gac caa gaa att gcc 288
Gln Phe Tyr Arg Pro Gln Arg Leu Ser Leu Lys Asp Gln Glu Ile Ala
85 90 95

cga agt agg agt agg aac agt agc tac ctg aag tgg aac aag cct gtc 336
Arg Ser Arg Ser Arg Asn Ser Ser Tyr Leu Lys Trp Asn Lys Pro Val
100 105 110

ccc tgg ctc tca gag ttc cgg ggc cac gcc aac cta cat gtc ttt gaa 384
 Pro Trp Leu Ser Glu Phe Arg Gly His Ala Asn Leu His Val Phe Glu
 115 120 125

gac tgg tgt ggc agc tcc atc caa cag ctg agg aac aac ctg cac ttc 432
 Asp Trp Cys Gly Ser Ser Ile Gln Gln Leu Arg Asn Asn Leu His Phe
 130 135 140

cca ctc tac ccc cac atc cgc aca act ctg agg aag ctg gct gtg tcc 480
 Pro Leu Tyr Pro His Ile Arg Thr Thr Leu Arg Lys Leu Ala Val Ser
 145 150 155 160

ccc aag tgg acc aac tat ggc ctc cgc ata ttt ggc tat ctg cac cct 528
 Pro Lys Trp Thr Asn Tyr Gly Leu Arg Ile Phe Gly Tyr Leu His Pro
 165 170 175

ttc acc gat ggg aaa atc cag ttt gcc atc gct gct gat gac aat gct 576
 Phe Thr Asp Gly Lys Ile Gln Phe Ala Ile Ala Ala Asp Asp Asn Ala
 180 185 190

gag ttc tgg ctg agt cgt gat gac cag gtc tca ggc ctt cag ctg ctg 624
 Glu Phe Trp Leu Ser Arg Asp Asp Gln Val Ser Gly Leu Gln Leu Leu
 195 200 205

gcc agc gtg ggc aag aca gga aag gaa tgg aca gcc cct gga gag ttt 672
 Ala Ser Val Gly Lys Thr Gly Lys Glu Trp Thr Ala Pro Gly Glu Phe
 210 215 220

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 Gly Lys Phe Gln Ser Gln Ile Ser Lys Pro Val Ser Leu Ser Ala Ser
 225 230 235 240

ctc agg tac tac ttt gag gtc ctg cac aag caa aat gat gaa ggc act 768
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 245 250 255

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 Asp His Val Glu Val Ala Trp Arg Arg Asn Asp Pro Gly Ala Lys Phe
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cta agg atg gat gag gtg ggc cat atc cca cag aca gca gcc agc cat 912
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 Met Leu Arg Pro Asp Pro Arg Asp Thr Leu Phe Arg Val Pro Leu Ile
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Ala Lys Ser His Leu Arg His Val Leu Pro Asp Cys Pro Tyr Lys Pro

340

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410

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420

425

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gaa tcc cag tat gaa gac gta cca gag gaa atc ccc acc tct caa gac 1344

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435

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Gln Ser Gly Pro Val Ala Pro Leu Ser Lys Gln Asn Ser Thr Thr Ala			
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ttt cca acc agg aca agc aac atc cca gtc cag cgg cca gag aaa agc			1536
Phe Pro Thr Arg Thr Ser Asn Ile Pro Val Gln Arg Pro Glu Lys Ser			
	500	505	510
cct gtg ccc agc cga gat ttg tct cat tct gac cag ggg gcc cgg agg			1584
Pro Val Pro Ser Arg Asp Leu Ser His Ser Asp Gln Gly Ala Arg Arg			
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aac ctg cct ctc atc cag aga gcc agg ccc act ggt gac aga cct ggg			1632
Asn Leu Pro Leu Ile Gln Arg Ala Arg Pro Thr Gly Asp Arg Pro Gly			
	530	535	540
aag act ctt gag cag tcc cag tgg ctg aat caa gtg gaa tcc ttc att			1680
Lys Thr Leu Glu Gln Ser Gln Trp Leu Asn Gln Val Glu Ser Phe Ile			
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Ala Glu Gln Arg Arg Gly Asp Arg Ile Glu Pro Pro Thr Pro Ser Arg			
	565	570	575

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 Gly Trp Arg Pro Glu Glu Asp Val Val Ile Ala Ala Asp Gln Glu Gly
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gaa gtg gag gag gag gaa gag ggg gaa gat gag gaa gaa gat atg agt 1824
 Glu Val Glu Glu Glu Glu Glu Gly Glu Asp Glu Glu Glu Asp Met Ser
 595 600 605

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 Glu Val Phe Glu Tyr Val Pro Met Phe Asp Pro Val Val Asn Trp Gly
 610 615 620

cag acc ttc agc gct cag aac ctc gac ttc caa gcc ctg aga acc gac 1920
 Gln Thr Phe Ser Ala Gln Asn Leu Asp Phe Gln Ala Leu Arg Thr Asp
 625 630 635 640

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 675 680 685

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Leu Asp Gly Gln Arg Leu Val Arg Leu Ser Glu Tyr Val Ser Thr Arg
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Gly Trp Arg Gly Gly Asp His Pro Gly Arg Glu Asp Thr Glu Ala Arg
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Asn Leu Gln Gly Leu Val Trp Ser Pro Arg Asn Arg His Arg His Val
740 745 750

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755 760 765

tcc tgg aac cat cga gct gtg gtc cac ttt att gtg cct gtg aag aac 2352
Ser Trp Asn His Arg Ala Val Val His Phe Ile Val Pro Val Lys Asn
770 775 780

cag gct cgc tgg gtg cag cag ttc atc aga gat atg gag agc ctg tcc 2400
Gln Ala Arg Trp Val Gln Gln Phe Ile Arg Asp Met Glu Ser Leu Ser
785 790 795 800

caa gtc act gga gat gca cat ttc agc atc att atc aca gac tat agc 2448
Gln Val Thr Gly Asp Ala His Phe Ser Ile Ile Ile Thr Asp Tyr Ser

805	810	815	
agt gag gac atg gat gtg gag atg gct ctg aag agg tcc aga ctg cgg			2496
Ser Glu Asp Met Asp Val Glu Met Ala Leu Lys Arg Ser Arg Leu Arg			
820	825	830	
agc tac cag tac ctg aag ctg agt gga aac ttt gag cgc tct gct gga			2544
Ser Tyr Gln Tyr Leu Lys Leu Ser Gly Asn Phe Glu Arg Ser Ala Gly			
835	840	845	
ctg cag gct ggc ata gac ctg gtg aag gat cca cac agc atc atc ttc			2592
Leu Gln Ala Gly Ile Asp Leu Val Lys Asp Pro His Ser Ile Ile Phe			
850	855	860	
ctc tgt gac ctg cac atc cac ttt cca gca gga atc att gat acc atc			2640
Leu Cys Asp Leu His Ile His Phe Pro Ala Gly Ile Ile Asp Thr Ile			
865	870	875	880
cgg aag cac tgt gtg gag ggc aag atg gcc ttt gcc ccc atg gtg atg			2688
Arg Lys His Cys Val Glu Gly Lys Met Ala Phe Ala Pro Met Val Met			
885	890	895	
cgg ctg cac tgt ggg gcc acc cca cag tgg cct gag ggc tac tgg gaa			2736
Arg Leu His Cys Gly Ala Thr Pro Gln Trp Pro Glu Gly Tyr Trp Glu			
900	905	910	
gta aat gga ttt gga ctg ctc ggg atc tac aag tct gac ctg gac aag			2784
Val Asn Gly Phe Gly Leu Leu Gly Ile Tyr Lys Ser Asp Leu Asp Lys			
915	920	925	

atc gga ggc atg aac acc aag gag ttc aga gac cgc tgg gga ggg gag 2832
 Ile Gly Gly Met Asn Thr Lys Glu Phe Arg Asp Arg Trp Gly Gly Glu
 930 935 940

gac tgg gag ctg ctg gac agg att ctc caa gca ggc ctg gaa gtg gag 2880
 Asp Trp Glu Leu Leu Asp Arg Ile Leu Gln Ala Gly Leu Glu Val Glu
 945 950 955 960

cgg ctc tcc ctc agg aac ttc ttc cat cac ttc cat tcc aag cga ggc 2928
 Arg Leu Ser Leu Arg Asn Phe Phe His His Phe His Ser Lys Arg Gly
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<212> DNA

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